Dissemination of small hydro schemes in Peru

"**Credits for installation and appropriate management of schemes"**

By: Teodoro Sanchez-Campos , Alfonso Carrasco-Valencia, ITDG-Peru

Summary

The present paper describes the experience in the dissemination of small hydro schemes in Peru, with the implementation of a credits scheme "*The Micro Hydroelectric Power Plant Promotion Fund", under an agreement between the Inter-American Development Bank (IDB) and the Peruvian branch of ITDG (ITDG-Peru), and the implementation of a sustainable management model which was also developed and piloted by a project ESMAP/ITDG-Peru, between 1996-1998. This "dissemination pack" is an example of a successful model for financing rural electrification through local government, the private sector and cooperatives, while providing technical assistance with planning and implementation, plus the implementation of an appropriate model for the operation and management of isolated energy schemes in rural areas. The fund started in 1994 and has provided loan finance for the implementation of 21 rural electrification schemes – 15 owned by Municipalities, 5 by the private sector and 1 cooperative. The model has developed over time and has demonstrated that loan finance to communities and the private sector can leverage local capital and government funds for locally owned and sustainable decentralised rural electrification. This is a replicable model for decentralised electrification based on renewable energy.*

1.0 The Micro Hydroelectric Power Plant Promotion Fund

1.1 Introduction

The Revolving Fund for the Implementation of Micro Hydroelectric Power Plants (MHPPs) is a project that began in 1994 with an agreement between ITDG-Peru and the sector of the Inter-American Development Bank (IDB) that provides aid to small companies. The project promotes a financial model that combines subsidised loans and technical assistance, through shared efforts between technical co-operation agencies and government institutions (local, regional and central governments). Its purpose is to meet the small-scale electricity requirements in isolated rural areas of Peru which are impossible to serve with the conventional grid system**.**

This project is part of the strategy that ITDG has been applying to promote micro hydroelectric power plants as an alternative for isolated areas, which is consistent with the need to promote appropriate financial mechanisms corroborated by the ESMAP/ITDG study done from 1996 to 1998 (see Annex). The latter study also provided valuable information for refining the implementation strategy for this project, particularly as far as its sustainability is concerned.

1.2 Credit conditions and existing capital

The credit model was designed to finance total or partial investments in MHPP projects in isolated rural areas, involving amounts ranging from US$10,000 to US$ 50,000 with an 8.5% interest rate (the current rate is 10%), reimbursement terms of 1 to 5 years and variable periods of grace depending on the financial situation of the client(s). Guarantees vary slightly depending on clients' circumstances and whether they belong to the public or private sector. Those from the public sector must show a positive cash flow, including short and medium term investment plans, whereas those from the private sector must submit actual and collateral guarantees for an amount equivalent to or higher than 130% of the loan requested. Electrical-mechanical equipment can form part of the guarantees. The project's total capital is US$700,000, of which US$400,000 represents the initial capital (1994 agreement) and US$ 300,000 represent the increase approved by the IDB in June this year. It is worth pointing out that the latest agreement also considers US$50,000 to be used to

support small-scale business and employment generating initiatives, utilising the power generated in the towns in which MHPPs were set up.

1.3 Credit subjects

Potential credit subjects or clients for this scheme are individuals or groups of people from isolated rural areas who wish to set up or upgrade hydroelectric power plants. In general, these can be divided into four categories. 1) Local governments – usually district Municipalities but not excluding provincial municipalities – who acquire the loan for the benefit of small villages. 2) Peasant producers devoted to farming, livestock breeding, the extraction and transformation of natural resources such as timber, small-scale mining, food processing, tourism, etc., who wish to build a small hydroelectric power plant to supply energy to their own private companies or businesses. 3) Peasant communities. 4) Co-operatives, particularly farming co-operatives, of which there are still a few.

Photo No. 1: Micro Hydro Power Plant in the Atahualpa Cooperative, Cajamarca.

1.4 Project Components

Although this is a single project involving a number of activities carried out by a team of experts at the same time, in general we can divide the activities into the four groups listed below, which are considered the project's components:

- Promotion of the project and its benefits
- Technical and financial assistance
- Organisation for a sustainable management
- Loan recovery

1.4.1 Promotion

This component involves obtaining basic data from communities and given them information, identifying the technical potential and opportunities in each area depending on their characteristics, identifying opportunities for placing loans, providing information to authorities and leaders, and submitting information to regional governments and central government officials (local units).

The methodology for this project component includes simple and perhaps even primary marketing and promotion techniques, materials and instruments, such as the direct delivery of information, the intensive organisation of visits, meetings and workshops and the exchange of information with local authorities and community leaders, based on the theory that the beneficiaries are the driving force behind their development. The following are the reasons for this type of promotion:

a) This is an unconventional project for a market in which the State is supposedly responsible for this type of financing. Urban techniques for marketing and delivering information are not

applied, since in most cases information is provided through direct channels such as visits, interviews, conversations, demonstrations, etc.

b) This is a project that mainly promotes decisions from the bottom upwards, reaching consensus between community members, local authorities and leaders first of all and then seeking the assistance of other government units or aid institutions.

The promotion work includes organising regional or local workshops attended by authorities, small-scale producers and community members, as well as participating in fairs or other events, particularly those of a regional or local nature. As far as information is concerned, the Programme has two important brochures, one on credit conditions and financing methods and another on the results achieved so far.

Finally, a sub-component of the promotion task is the preliminary evaluation of projects and opportunities. That is to say, advantage is taken of the visits made to interested and/or potential clients to evaluate resources and the interest shown by the people and their leaders in gaining access to electricity.

1.4.2 Technical and financial assistance

This component consists of a number of activities related to the preparation of technical and financial case proposals to justify both the project and the loan and to obtain joint funding for these, as well as providing technical guidance, supervising the construction work, accepting works, putting the systems into operation, and training operators and administrators to manage the schemes in an efficient and sustainable manner.

a) Financial feasibility and engineering studies.- One of the requirements for gaining access to credit is to submit a technical and financial proposal containing detailed engineering documents, specifying the following:

- the demand for energy and its potential growth,
- energy resources, the physical works to be constructed, machinery to be installed, etc.,
- the total budget required to implement the project and the implementation schedule.

Financial assistance includes the establishment of a financing scheme that clearly indicates the items covered by the loan (mainly equipment and facilities) and possible joint funding sources (when the power plants are for municipalities). This makes it possible to search for complementary funds and establish commitments with joint finance agents at the same time. Once these requirements have been fulfilled, the interested party can submit the project, together with a loan application. Next, ITDG will ask a local consultant to conduct a financial and guarantee appraisal.

Once the technical and financial case studies are prepared and the consulting firm has completed the budgets and financial appraisal, the credit committee shall either approve or reject the loan application.

b) Technical supervision and works management.- Once the loan is approved, the technical team will take over the technical supervision of the works implementation, making sure that work schedules are complied with. Likewise, the consulting firm (AFIDER) will supervise the expenditure, making sure agreements are kept. In most cases, clients ask ITDG to supervise the entire works and even implement certain parts. When ITDG is not involved in the implementation, it maintains constant co-ordination with the constructors to make sure they meet the specifications established in the project documents. Briefly, the supervisor's task entails drawing up terms and conditions for agreements with suppliers of equipment and materials, participating in the selection of contractors and/or consultants, supervising the manufacture, transport and installation of equipment and putting the power plant into operation.

c) **Works acceptance and start-up.-** Each power plant is implemented in a different way, depending on user requirements and preferences. In most cases, local authorities prefer it if ITDG does most of the implementation work directly. However, when the owners of MHPPs are private producers, they are usually more interested in participating in and controlling the implementation, in which case ITDG plays an advisory role. That is why works acceptance and start-up tasks also differ. Obviously, fewer tests are required for the plants implemented by ITDG, since the expertise of the implementing staff ensures the quality of the works, whereas quality control tests are required for plants implemented by private consultants.

d) **Training.-** Training work is fundamental for ensuring the operation and adequate maintenance of the power plant. As a general strategy, potential operators are selected as soon as the works implementation begins, so that they can participate in all stages of the construction, thus receiving plenty of training throughout the implementation of the project. In addition, they receive training on maintenance and operation once the schemes are completed.

Photo No. 2: Training on energy uses.

1.4.3 Organisation for sustainable management

Organisation and management training are just as important as the implementation of the system, if not more so (see the next section for details on the model used). This component requires a tremendous effort, since to a large extent, the future of the power plant depends on it.

As in other components, the efforts made by ITDG vary depending on whether the plants are owned by municipalities or private owners. In the former case, the organisation and training activities start at the beginning of the project when possible candidates for this work are identified, recruited and the training itself begins. This work is co-ordinated with local authorities and leaders and users are constantly kept informed. In the case of privately owned power plants, the work is simpler, since many aspects have already been defined: the operation and maintenance manager will have been chosen by the owner and the system, management model and administrator will also have been decided. So far, without exception, these responsibilities have always been assumed by one or more family members.

1.4.4 Loan recovery

Loan recovery is an important but complicated task, which requires careful monitoring of clients, frequent consultations with the bank, notices of payment deadlines, etc. In the event of any delay or non-payment, the loan agreements contain regulations that permit legal recovery actions. So far, no enforcement actions have been required. Under the IDB/ITDG agreement, a small consulting firm (AFIDER) was contracted for this work and to conduct financial appraisals of each project. This institution charges 1.5% of the pending payment balance at the end of the year as compensation for the loan recovery work, and a fixed sum of US$ 700 for each financial appraisal.

1.5 Institutions involved

IDB.- Initial working capital contribution equivalent to US$ 400,000 plus a single contribution of US$ 120,000 for technical assistance, to cover the costs of the first round of loans, during which time this entity carried out a monitoring activity. In June this year, it approved a capital increase of US$ 300,000, making a total capital of US$ 700,000 that will be made available to users from December 2000.

ITDG.- Responsible for the project and its implementation, this institution will return the working capital to the IDB within a period of 25 years under soft loan conditions with an 8-year period of grace. Its tasks include

- promotion work,
- technical evaluations,
- socio-economic feasibility studies,
- technical assistance,
- organisation and training of future power plant operators and administrators,
- co-ordination with joint funding organisations regarding their contributions and commitments,
- assistance to AFIDER, providing technical, financial and socio-economic information so that a **project team** can evaluate the schemes. It approves loans through its **credit committee.**

AFIDER.- This is an independent institution based in Cajamarca (in the northern part of the country), responsible specifically for preparing financial case studies for loan applications (as part of the assistance to clients), evaluating guarantees, recovering loans and taking legal action if necessary.

Joint financing agents.- These are the organisations that provide non-reimbursable funds to complement the funding of power plants. As mentioned above, there are many different kinds of joint financing agents, the most important being the regional government and the central government through FONCODES,[1] followed by local governments, certain non-government organisations and others that finance the "hard part" of construction works. Also included are institutions that contribute non-reimbursable funds for the "soft part", i.e. the continuation of promotion work, organisation, training and other tasks.

Credit subjects.- Owners of power plants applying for loans.

[1] FONCODES, National Compensation Fund, is a decentralised organisation of the Ministry of the Presidency responsible for implementing projects to aid social development throughout the country, with non-recoverable State investments.

Comparison with conventional (Government) MHPP implementation models:

The following table contains a brief summary of the differences between the conventional Government model and the ITDG/IDB model.

Fundamental factors	Conventional Projects	ITDG/BID Revolving Fund
Subsidies	• Subsidies are not considered. Investments are non-recoverable.	• For municipalities, investments are subsidised (70% and 75% of the total) • For private owners, investments are not subsidised. • Subsidy, technical assistance and transaction costs plus interest for private owners.
Technical aspects	• Conventional design, with the same concepts as large power plants • Use of demanding standards (urban) • Expensive technologies (imported equipment) • Limited community participation in the implementation	• Appropriate designs, limited studies. • Standards are only fulfilled when these are important for the operation or for safety reasons. • Low-cost technologies (national) • Community participation in the construction
Promotion	• No promotion as Government plans are drawn up and implemented.	• Tremendous promotion efforts are made, in direct contact with the population, who decide whether or not to implement their system.
Costs	• High investment costs • No transaction costs	• Low investment costs, 50% or less than conventional projects. • High transaction costs

Comparison with other Renewable Energy credit models implemented in Peru over the past ten years:

During the previous decade, there were 3 models besides the credit programme promoted by the ITDG/IDB agreement; two of these were for Micro Hydroelectric Plants and the third for photovoltaic solar systems.

Financial And performance indicators	Model			
	PRONAMACHS (Government)	**PROER**	**Tequile**	**ITDG/IDB**
Origin of resources	Government	Dutch Government Donation	Government	IDB (small enterprise sector)
Initial capital	Abundant	US$ 5 Million	US $ 60,000	US$ 400,000
Loan amounts	Indefinite (depending on requirements)	Up to US$200,000.00	Cost of a Home Solar System	From US$10,000.00 to US$ 50,000.00
Loan coverage	100% investment initially, then only equipment	100% of the investment	100% of the investment	25% to 30% of the investment
Interest	Initially lower than the commercial rate	Commercial	Commercial	Subsidised 10% at present, previously 8.5%
Application	Only MHPPs	Any kind of RE related business	Only photovoltaic systems	Only MHPPs
Scope	Nation-wide	Nation-wide	Tequile island, Puno	Northern region initially, now nation-wide
Subsidies	On interest and technical assistance	On interest	Technical assistance	Interest Technical assistance and investment
Number of loans placed	More than 30	2	More than 120	21
Loan recovery	Less than 5% of the total	100%	100%	100%
Current status	Closed (incomplete)	Closed (incomplete)	In operation	In operation
Leverage	0.00	0.00	0.00	More than 2.5 Million
Qualification	Financial failure Political handling	Total failure	Technical and financial success	Technical and financial success
Replicability	No	No	Study required, not a typical area for development	Replicable

2.0 Management Model Used

As mentioned previously, privately owned power plants present no major problems as far as management is concerned, since they are relatively simple and require less administrative assistance. Therefore, the same approach to management has been applied to community schemes.

In this respect, one of the most important parts of the ESMAP/ITDG work mentioned above, was the ex-post evaluation of a number of isolated power generating facilities, both hydro and diesel. In particular, the study revealed that of the 13 power plants situated in different parts of the country producing between 50 kW and 1MW of power, one of the weakest aspects of the operation of these isolated systems (no matter who owned them) was the lack of an appropriate and efficient management plan. Based on these results and as part of the same job, a plan was designed for the efficient management of the electrification schemes. The resulting model is referred to as **"Management Services for Isolated Power Systems".** Since then, a pilot model was implemented in Conchan (a small district in the Chota province, department of Cajamarca). This approach has now been adopted as the final plan for all MHPPs implemented with the IDB/ITDG Revolving Fund Project.

2.1 The model

The main principle of this model is the *efficient management* of the service. In rural areas of Peru, efficient management implies well-defined responsibilities versus well-defined benefits. In this model, the owners of the power plant (i.e. the community, represented by their Mayor) contract the operation, maintenance and tariff collection for the plant to a private company under a specific medium or long-term, legally binding contract, with clear and specific terms of reference. Consequently, the model requires three main agents: owner, users and the management service company.

2.2 Owner

Whoever owns the power plant is referred to as the owner. In small towns, this is usually the Municipality (although in more general terms, the Municipality represents the interests of the people). Since in the majority of places where power plants have been implemented it is the municipality that assumes the respective loan, it is reasonable to look upon the municipality as the owner. In other cases (community, private or co-operative owners), the ownership status is more clearly defined.

2.3 The company

The company responsible for managing the service should be a local company awarded the winning bid at a public call for bids, under current legal standards. Since there are no private energy companies operating in rural areas, the procedure followed for this special purpose is to conduct a formal process, addressing letters of intent to potential entrepreneurs. Once the proposals have been evaluated and the successful bid awarded, the company must carry out all the necessary transactions to accept responsibility for the management of the electricity services. This process must be as transparent and democratic as possible, with the participation of the assembly of users and the owner.

2.4 Users

These are the people who will receive electricity services, which they will pay for.

3.0 Results obtained so far from the revolving fund as a financial model

a) So far, all the initial capital amounting to US$400,000 has been placed and loans have been granted for an amount exceeding US$300,000, using money recovered from the first round of loans.
b) The credit system is working adequately, with overdue debt ranging from 2% to 8%, mainly because of the isolated nature of these small towns and their limited means of communication.

Photo No. 3: Use of energy in the Micro Hydro Power Plant of Yumahual.

c) Under this model so far, 21 loans have been granted for a total of US$700,000 and a leverage of over US$2.5 million, which generated additional power in excess of 1 MW in isolated areas, directly benefiting more than 12,000 rural dwellers.
d) Different sectors now feel confident about the viability and acceptance of the project.
e) People are now aware of the fact that electricity is a service that is costly and, therefore, must be managed professionally. In other words, they realise that due care and importance must be given to the system.

Ownership and type of business set up so far:

Ownership	Type of business	Number
Municipality	Supply of electricity to local population	15
Private	Processing timber and ice-making	1
	Sale of electricity and battery-charging services	1
	Battery-charging, milling businesses	1
	Chicken breeding and complementary businesses	1
	Tourism	1
Co-operatives	Supply of electricity for farming and domestic purposes	1

4.0 Lessons obtained from the implementation of the project

The revolving fund provided a great many lessons and a wealth of information regarding the various aspects involved in implementing projects in isolated rural areas.

4.1 General

a) Through this approach, efforts were combined to speed up the implementation of projects that had been postponed due to the lack of realistic and viable financial initiatives.
b) The rural market is basically poor, making it very difficult to recover total investments. Some subsidies are necessary if the government wants to speed up the rural electrification process, but a significant local contribution is possible.
c) The costs of promoting technical assistance in a project of this nature are high, due to the characteristics of the market and the difficulty of gaining access to it.
d) The financial model applied for hydroelectric plants could also be applied to other renewable sources of energy, with slight changes.
e) The revolving fund is viable and advisable from the point of view of the population's commitment and the need to speed up the rural electrification process.

4.2 Technical terms

- The high costs of acquiring and installing equipment can only be reduced substantially by investing in the transfer of low-cost technologies to small workshops and in training local experts to carry out consulting work. As a result, suitable machinery, spares and advisory services can be made available. The incorporation of non-conventional equipment such as lighting transformers, self-supporting cables, engines as generators, etc., can reduce equipment costs considerably.

- Civil works usually take up a high percentage of the total cost of the project (30% to 50%), therefore the design and transfer of low cost civil works technologies is equally as important as reducing the costs of equipment, if not more so.

- Future operators must be trained from the very start, and efforts must be made to find the most appropriate ways of helping them participate in every stage of the implementation.

4.3 Social terms

- The population must be kept informed of every step, from the initial studies until the completion of the construction work. Their participation, in one way or another, is very important.

- The team responsible for the installation must create an atmosphere of trust among the population and take advantage of every opportunity to heighten the people's awareness of the value of energy and its costs, the need for sustainable systems, the dangers of having poor management, electricity hazards, etc. In other words, the implementation team must also promote sustainability.

Photo No. 4: Electrification in La Peca Community.

4.4 In Institutional terms

This project has revealed certain aspects that are intrinsic to the type of institutions that own the system. The following lessons are worth mentioning, depending on the institution:

- In a project such as this one without a clear source of subsidies, the efforts to obtain them could seriously delay the implementation, perhaps even increasing the implementation period to 3 or 4 years.

- The majority of rural communities believe that electricity is a right that the State owes them and which they will obtain sooner or later at no cost. Although this is not realistic it is a hurdle that slows down decisions, as communities may put their money into less important investments that they do not expect the state to fund.

- In the case of private projects, the promotion and implementation team must respond quickly with the lowest and most solid cost estimates, i.e. "maximum efficiency", whereas in the case of local governments, speed is important but not a determining factor.

- When awarding loans to local governments, their periods in office must be taken into consideration, since every time a new mayor takes over, payments are disrupted. This is not a problem with private projects that are not influenced by politics.

- As far as local governments are concerned, the profitable nature of the power plant is not an important aspect for ensuring the reimbursement, as it is generally understood that small isolated systems are not profitable. What is important is to make sure there is a positive cash flow and that joint funding is obtained. In private systems, on the other hand, profitability is vital. That is why municipalities require shorter reimbursement periods and shorter periods of grace, whereas private schemes require longer reimbursement terms and periods of grace.

- As far as operational management is concerned, private schemes require little assistance, as everything is organised from the moment the project is conceived. Most likely the head of the

family or one of the children will play the role of operator, administrator, etc. In the case of local governments, this is a critical aspect for the sustainability of the project. In other words, it is safe to say that if a private system is profitable it is sustainable, whereas in the case of a local government, effective management is required to ensure the sustainability of a project.

- In view of the above, in terms of costs and time, management costs of local governments are very high and must be covered by the project. The case of private properties is much simpler.

- As regards risks, particularly those related to loan recovery, the greatest risk in the case of private projects is the failure to earn profits. In the case of local governments, this can be overcome, although political finesse is required to work with them, particularly when there is a turnover of authorities.

4.5 In management terms

- As far as ITDG is concerned, management is the most important aspect to guarantee the sustainability of an isolated power generating system. So far, few models have been designed that describe the role of each agent involved. Among published experiences there is an abundance of recommendations regarding how the community could participate effectively in management. The "Electricity Management Services" model promoted by ITDG as a result of the ESMAP/ITDG work, promotes the business management concept, including efficiency, low costs, order, reliability, etc.

- Nevertheless, there are still a number of obstacles that impede their application, including the legal and regulatory framework for small-scale enterprises, which were designed with urban areas in mind.

- The lack of small companies in rural areas, which could quickly be adapted or assimilated.

- Legal incorporation and selection procedures, etc.

- However, once they are incorporated, their efficiency and low cost have proved to be a great advantage.

- There are numerous prejudices in rural areas, such as the "non-payment culture", paternalism "The government as the provider", "electricity is a right of the people" and others, promoted by opportunistic politicians. Nevertheless, it is possible to gain confidence and carry out organisation work based on new concepts that imply positive changes, such as efficiency.

5.0 Limitations or difficulties encountered in this project

1) Joint funding is uncertain and much effort is needed to obtain it.
2) Subsidies for technical assistance are difficult to obtain. ITDG is making a great effort to obtain the necessary funds at an international level.
3) National standards are a constant problem in both technical and management terms. (Existing tax standards are too difficult to apply to the rural sector)
4) Competition of other projects with 100% non-recoverable investments.

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ANNEX 1 – RURAL ELECTRIFICATION IN PERU - BACKGROUND

1) General background

Peru, a country covering 1.28 million square kilometres, has a population of 25.5 million people, of which 72% live in urban areas and 28% in small rural villages or spread across the countryside. In view of its complex geography and the diversity of its climates and ecological areas, the country has a rich wildlife biodiversity. In geographical terms, Peru is divided into three distinct natural regions: the coastal region on the west, a narrow, 3000 km. long strip on the shores of the Pacific Ocean, comprised mostly of desert land. The Highland region in the middle, formed mainly by the Andes mountain range that runs north to south, with high mountain peaks and small Andean valleys; and the Jungle region on the east, which covers more than 50% of the total territory, with lush forests and large rivers that are prone to flooding most of the year. Peru is a centralist country in every sense: 30% of the population and 60% of industries are concentrated in Lima, the capital city, where virtually all economic, social and government activities are managed. The coverage of basic services is low, particularly in inaccessible rural areas where they prove to be more expensive because of the isolated nature of rural towns, the lack of roads and the widespread nature of the population.

2) The present status of rural electrification In Peru

According to official figures quoted by the Executive Projects Office (DEP) of the Ministry of Energy and Mines, the national electricity coverage in late 1999 and early 2000 reached 73%, with a 3% annual growth rate over the past 8 years, whereas the rural electrification coefficient for the same period was 25%, with a 2.5% growth rate. The rapid growth of recent years reveals the efforts made by the government during the last decade to increase the electricity coverage, particularly in the rural sector where there are major difficulties and where progress is generally achieved when the government is directly involved. Nevertheless, the expansion of the electrical frontier in rural areas was mainly based on the extension of the interface system grids, through Ministry of Energy and Mines and Ministry of the Presidency programmes, under the National Social Compensation Programme (FONCODES). To a lesser extent, isolated systems such as diesel plants, mini and micro hydroelectric power plants were also implemented. Only in a few cases were other renewable energies used, such as in pilot programmes of the Ministry of Energy and Mines and of certain co-operation agencies.

3) Characteristics of the Rural Electricity Market in Peru

Between 1996 and 1998, ESMAP and ITDG together drew up a case study on rural electrification in Peru, with a view to understanding the characteristics and limitations of the rural market and the opportunities available for improving the rural population's access to electricity in a sustainable manner (see Peru Rural Electrification Activity Completion Report 1999"). Below is a summary of the main lessons obtained from this study:

3.1 Legal and Institutional Framework

The current legal framework makes no distinction between rural electrification and urban electricity businesses. During the seventies and eighties, ELECTROPERU was in charge of all electricity-related activities, including rural electrification. The Executive Projects Office (DEP) was created in the early nineties to promote and implement projects, a role it is still responsible for. In 1998, the operation and property of rural electrification systems and all other related assets were transferred from ELECTROPERU to ADINELSA. Furthermore, in 1999 a national strategy was designed, which has still not been enforced.

The lack of a specific rural electrification law not only makes it difficult to promote this sector, but it also impedes the development of specific innovating activities aimed at improving rural electricity

services, since any legal requirement must be governed by general laws. For example, existing standards must be respected when creating small service companies.

3.2 Opportunities for gaining access to electricity services

The large territory and complex geography in this country and the fact that the majority of rural communities are far removed from the grid or even from roads (for oil supplies), restricts their chances of gaining access to electricity. The more isolated they are, the less likely it is that they will gain access to electricity. Likewise, the more isolated communities require higher investments per capita in order to gain access to electricity, be it the grid or some isolated power generating system. Furthermore, in the latter case, the limited local capacity to operate and manage existing systems seriously restricts their opportunities for gaining access to a sustainable source of energy.

3.3. Financial aspects and rural electrification in Peru

The rural market in Peru is basically poor, with family income levels ranging from US$300 to US$1400 a year. Consequently, any rural electrification programme requires a careful analysis of this aspect, without resorting to a total donation – as has always been the government's practice – nor to total recovery in commercial terms, as suggested by free market tendencies.

Following the new financial trend of recent years which places emphasis on recovering investments, various financial models were tried out in Peru that consider recovering costs, to a greater or lesser extent. These include the PRONAMACHS Model (Ministry of Agriculture) implemented between 1994 and 1998 to grant loans to rural communities so that they could set up small hydroelectric power plants; the PROER, designed and implemented by COFIDE, with financial aid from Holland and applicable to renewable energies in general; and the ITDG/IDB revolving fund, which grants loans for the implementation of Micro Hydroelectric Power Plants (MHPPs). The first of these ended in 1998 with the debt being condoned, after virtually no costs were recovered; the second encountered great difficulties due to the design and aims of the model. Below is a description of the approach, development and impact of the third model.

3.4 Rural electrification organisation, management and property aspects

The result of the joint studies conducted with ESMAP proved that the most relevant factor for the sustainability of isolated systems is the organisation and creation of local capabilities for the operation, maintenance and administration of isolated rural systems.

Well aware of the importance of this factor, the government has tried out more than one management model, involving the community in one way or another in the direct management of these systems. Furthermore, ITDG successfully implemented the "electricity management services" model designed within the framework of ESMAP, the results of which are described further on in this report.

3.5 Local capacity

The local capacity must be considered from two different points of view: the capacity to manufacture equipment and spares and implement systems, and the capacity to manage the systems There is a capacity to manufacture equipment in Peru at present, particularly as regards MHPPs, although unfortunately the market is limited. However, operating and maintenance skills for isolated systems are very limited, and the time and resources required to develop them are not normally taken into consideration in rural electrification projects. Consequently, a rural electrification strategy should consider this matter a priority and allocate sufficient funds. As mentioned above, the more isolated the community is, the more limited its access to information, education, etc., which means that more time and funds are required to create them.